Course Syllabus

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BIOC 335/536: Cellular and Molecular Animal Physiology

SYLLABUS Spring 2019

We aim to have you learn mechanisms by which animals solve day to day problems of staying alive; learn skills, strategies, and ways of thinking that are particularly relevant to the study of physiology; and perhaps most important of all, enjoy learning the marvelous phenomena of the animal world.

Meetings:	Tuesdays & Thursdays, 9:25-10:40 AM, Rayzor (RZR) 123
Instructors:	Beth Beason-Abmayr, PhD: HBH 08A (office) / ABL 126 (lab); bbeason@rice.edu (mailto:bbeason@rice.edu) David Caprette, PhD: HBH 08B (office) / ABL 127 (lab); caprette@rice.edu (mailto:caprette@rice.edu)
Office Hours:	Dr. Beason: email me for an appointment Dr. Caprette: please check my schedule at the url http://www.ruf.rice.edu/~bioslabs/bios415/Office_hours.html (http://www.ruf.rice.edu/~bioslabs/bios415/Office_hours.html) or email me for an appointment
Required Resources:	TEXT: *Animal Physiology*, Fourth Edition, Hill et al. (2016) Computer for in-class participation/discussion; access to web, including Canvas

Course Learning Goals and Intended Learning Outcomes

Goal: Acquire a fundamental knowledge of "how animals work"

Learning outcomes

- Demonstrate a working knowledge of mechanisms by which animals function
- Explain how selected physiological mechanisms came to be

- Describe the integration of physiological systems
- Consider interactions between animals and their environments
- Predict possible trade-offs and physiological constraints

Goal: Recognize how prior and new knowledge relate to current/future work

Learning outcomes

- Integrate your knowledge of physiology with new information along with your previous knowledge of biology
- Apply your knowledge and experience to answer questions, solve problems, and investigate case studies in multiple contexts

Goal: Appreciate the importance of animal physiology

Learning outcomes

- Demonstrate a desire to learn more about the mechanisms responsible for animal function
- Relate physiological mechanisms in animal models to the health and disease of non-human animals and animal populations
- Relate physiological mechanisms in animal models to human health and disease

Goal: Understand how to collect, integrate, and communicate information

Learning outcomes

- Acquire information from the primary literature
- Distinguish reliable from unreliable information found on the web
- Critically evaluate information from various sources
- Share new information, ideas, and critiques though written and oral communication

Goal: Exercise responsibility and teamwork

Learning outcomes

- Prepare for class
- Develop ways in which to work effectively within a group
- Communicate openly with your group inside and outside of class
- Engage and actively participate in group work in a constructive manner

Accommodations for students with disabilities

Course material will be delivered either digitally (online or email) or in person and may be visual (written documents, slides, videos, etc.), audio (videos, presentations, discussions), or interactive (questions, discussions, clickers, etc.). Course work will require answering questions online, typing papers, reading written materials, discussing material with peers, taking written exams, and may include light lifting and sitting

for extended periods of time. Some interactive portions of lectures will not be available online; thus, students should choose or request seating where they are best able to view and hear presented materials.

Any student with a documented or suspected disability needing academic adjustments or accommodations is requested to *speak with the instructor in person during the first two weeks of class*; all discussions will remain confidential. Students with disabilities should also contact Alan Russell (**alan.g.russell@rice.edu (mailto:alan.g.russell@rice.edu)**), Director, Disability Support Services (713-348-5841) before the first day of class.

Information contained in this syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructors.

Schedule

Dates/due dates for specific deadlines/events are in **blue;** some of these contain links to the assignments in Canvas. Scheduled class activities are in **purple**. Links to or PDFs of assigned research articles and additional assignments and due dates will be posted in Canvas.

Date	TUESDAYS	Date	THURSDAYS
Tues 1/8 Week 1 **Reflection 1**	**Course Introduction** • class structure • class prep: expectations & responsibilities • group work **Class Activity:** Group Behaviors **Assignment:** Biology Review, Hill et al., Ch. 1-5 (quiz in Canvas)	Thurs 1/10	***Begin "Food, Energy, and Temperature" (Pt II of text)*** Read Ch. 6 Nutrition, Feeding, and Digestion, pp. 131-141 & 160-163; Ch. 7 Energy Metabolism, pp. 165-186 **Animals in the Spotlight** **Class Activity:** Metabolic Scaling **Group Contract:** Concept Map and team assignment
Tues 1/15 Week 2	Read Ch. 8 Aerobic and Anaerobic Forms of Metabolism, pp. 189-212	Thurs 1/17	**Research Article 1:** Polar bears and high energy requirements

	Class Activity: ATP strip sequence **Animals in the Spotlight** **Biology Review Questions** **Due: Biology Review: PART I Fundamentals of Physiology**		**Hill Study Questions:** Exam practice
Tues 1/22 Week 3	**Mini Exam 1: Ch. 6-8 (50 min, in-class)** **Group Contract**	Thurs 1/24	Read Ch. 9 The Energetics of Aerobic Activity, pp. 215-230 **Animals in the Spotlight** **Research Article 2:** Fin whale and locomotor muscle morphology and metabolism **Due: Group Contract (1/25)**
Tues 1/29 Week 4 **Reflection 2**	Read Ch. 10 Thermal Relations, pp. 233-281 **Animals in the Spotlight** **Handout: HW 1: Countercurrent Heat Exchange Mechanisms** **Fictional Animal Project:** Introduction; 1st design; QS 1 **Concept Map 1: Part II Food, Energy, and Temperature (due 2/1)**	Thurs 1/31	Read Ch. 11 The Lives of Mammals in Frigid Places, pp. 287-301 **Animals in the Spotlight** **Research Article 3:** Ground squirrel iPSC-differentiated neurons **Due: HW 1: Countercurrent Heat Exchange Mechanisms (Canvas)** **Hand-out: Research Articles (RA) Exam 1**
Tues 2/5 Week 5	**Mini Exam 2: Ch. 9-11 (50 min, in-class)** **Fictional Animal: QS 1 due 2/6**	Thurs 2/7	**SPRING RECESS**
Tues 2/12	***Begin "Oxygen, Carbon***	Thurs 2/14	Read Ch. 24 Transport of

Week 6	***Dioxide, and Internal Transport" (Pt V of text)*** Read Ch. 22 Introduction to Oxygen and Carbon Dioxide Physiology, pp. 585-597; Ch. 23 External Respiration: The Physiology of Breathing, pp. 599-626 **Animals in the Spotlight** **Fictional Animal:** 2nd design		Oxygen and Carbon Dioxide in Body Fluids, pp. 635-665 **Animals in the Spotlight** **Class Activity:** Cooperativity in O_2 binding **Handout: HW 2: Oxygen Affinity, O2 Equilibrium Curves, and Oxygen Carrying Capacity** **Due (2/15): RA Exam 1 (Canvas)**
Tues 2/19 Week 7	**Mini Exam 3: Ch. 22-24 (50 min, in-class)**	Thurs 2/21	Read Ch. 25 Circulation, pp. 667-692 **Animals in the Spotlight** **Fictional Animal:** 3rd design; QS 2 **Assignment: HW 3: The Vertebrate Circulatorium** **Fictional Animal: QS2 due 2/22**
Tues 2/26 Week 8 **Reflection 3**	Read Ch. 26 Diving by Marine Mammals, pp. 701-718 **Animals in the Spotlight** **In-class: HW 4: Circulation** **Begin: Concept Map 2: Part V Oxygen, Carbon Dioxide, and Internal Transport**	Thurs 2/28	**In-class: Fictional Animal work** **Finish: Concept Map 2: Part V Oxygen, Carbon Dioxide, and Internal Transport** **Due: HW 2: Oxygen Affinity, O2 Equilibrium Curves, and Oxygen Carrying Capacity (Canvas)**
Tues 3/5	**Research Article 4:** Drivers of the dive response in seals	Thurs 3/7	**Mini Exam 4: Ch. 24-26 (50 min, in-class)**

Week 9	**Hand-out: RA Exam 2** **Due: HW 3: The Vertebrate Circulatorium, HW 4: Circulation (Canvas)**		**Fictional Animal: QS 2** **Fictional Animal: QS 2 due 3/8**
Tues 3/13	**SPRING BREAK**	Thurs 3/15	**SPRING BREAK**
Tues 3/19 Week 10	***Begin "Water, Salts, and Excretion" (Pt VI of text)*** Read Ch. 27 Water and Salt Physiology: Introduction and Mechanisms, pp. 723-739 **Animals in the Spotlight** **In-class: U/P ratios; cell volumes** **Fictional Animal:** 4th design; QS 3 **Due (3/18): RA Exam 2 (Canvas)**	Thurs 3/21	Read Ch. 28 Water and Salt Physiology of Animals in Their Environments, pp. 741-777 **Animals in the Spotlight** **Research Article 5:** Avian thermoregulation in the heat
Tues 3/26 Week 11	**Research Article 6:** Gill ionocytes in Japanese seabass	Thurs 3/28	**Mini Exam 5: Ch. 27-28 (50 min, in-class)** **Fictional Animal:** QS 3
Tues 4/2 Week 12	Read Ch. 29, Kidneys and Excretion, pp. 779-813 **Animals in the Spotlight** **Begin Concept Map 3: Part VI Water, Salts, and Excretion** **Hand-out: RA Exam 3** **Fictional Animal: QS3 due 4/3**	Thurs 4/4	**Class Activity: Countercurrent Multiplier (CCM)** **Assignment: HW 5: Countercurrent Multiplier**
Tues 4/9	Read Ch. 30 Mammals of Deserts and Dry Savannas, pp. 815-828	Thurs 4/11	**Mini Exam 6: Ch. 29-30 (50 min, in-class)**

Week 13 **Reflection 4: Fictional Animal & Group Project**	**Animals in the Spotlight** **Finish Concept Map 3: Part VI Water, Salts, and Excretion** **Due: HW 5: Countercurrent Multiplier (Canvas)**		**In-class: Fictional Animal work**
Tues 4/16 Week 14	**Due (4/17): RA Exam 3 (Canvas)** **In-class Fictional Animal work: QS 4 and PPT** **FINAL EXAM REVIEW**	Thurs 4/18	**Fictional Animal Showcase** **Fictional Animal: QS 4 and PPT due 4/18** **FINAL EXAM REVIEW**
Date	**POST-CLASS**	**Date**	**POST-CLASS**
Sat 4/27 9am-12pm *TBA*	**FINAL EXAM: Integrated and Comprehensive**		
Mon 4/29 11:59 pm	**Reflection 5: Group Work (Canvas)** **Reflection 6: Overall Course (Canvas)**	Wed 5/1 11:59 pm	**EXTRA CREDIT: Letter to the next class; Cellular and Molecular Animal Physiology Research Article; Integrated Concept Map (Canvas)**

Grading and Policies

You will be graded on an absolute scale by percentage, as in the table. This policy means that you will not be graded relative to the performance of others in your class.

A+	≥ 98		B	83 to < 87		C-	70 to < 73
A	93 to < 98		B-	80 to < 83		D	60 to < 70

A-	90 to < 93		C+	77 to < 80		F	< 60
B+	87 to < 90		C	73 to < 77			

Activity	Grading Criteria	% total
In-Class Mini-Exams	Focused and accurate answers to short answer and essay questions, quantitative and semi-quantitative problems; individual and group parts (*see below*)	35
Research Article (RA) Exams	Focused and accurate answers to short answer and essay questions about assigned research articles; online submission (*see below*)	15
Final Exam	Focused and accurate answers to short answer and essay questions, quantitative and semi-quantitative problems; individual and group parts; in-class during scheduled final period and online submission (*see below*)	20
Fictional Animal	Each team will be assigned a random, fictional animal and your job as a team is to consider if this animal can survive. In particular, you are interested to determine if its body systems are compatible with each other (*see below*).	20
Engagement & Participation	Individual or team grades based on assessment of participation in group activities and in class discussions and efforts/contributions to in-class and out-of-class assignments. These Formative Assessments include Group Contract, In-class Participation, Reflections, Minute Questions (MQs), Homework, Concept Maps, and Reading Quizzes (*see below*).	10

Policies

This semester we will be conducting a study looking at teaching and learning. The purpose of this study is to determine the factors that influence teaching effectiveness and learning. Your participation in this study will last for the duration of the current semester and will entail activities no different from the regular activities you

would otherwise engage in as part of the course. If you would like more information, please do not hesitate to ask. *If you would like to opt out of the study, please talk to Dr. Beason as soon as possible.*

- **Course Surveys:** Throughout the semester, Dr. Beason will collect some information about your experiences in this class to help us make this class as productive and effective as possible not only for you but also for future students. The surveys should take 10 minutes or so to complete. The questions are asked one at a time, and you can save your work and return to it later if you are interrupted. Survey results will not be analyzed until after final course grades have been submitted.

In accordance with the **Rice Honor Code**, work on assignments other than those specifically identified as group activities must not be shared with other students. All submitted work must be your own. Detailed guidelines are specified with each assignment in Canvas. Information regarding plagiarism is available on the Rice Honor Council website, and all students should be familiar with these guidelines.

Attendance policies. We do not directly record attendance, however you must be in class to earn credit for minute questions, concept maps, and in-class group activities and discussions. If you report and document an excused absence (see below) then we will adjust your scores accordingly.

Excused absences. Any absence due to circumstances beyond your control will be excused. You will be responsible for all content covered during the missed class but will not be held responsible for graded in-class activities. We may require documentation such as a note from a physician or a death notice. We may ask for a note from a faculty or staff member who can attest to the necessity of your attending an event in the case of a travel conflict.

Electronics policy. Use of electronics (e.g., computers, tablets, cell phones) during class is *strictly prohibited* unless instructed to do so for a class activity. If you prefer to take notes electronically, please obtain instructor permission to do so. During those times when you use a laptop or hand-held device during class to look up information, you should not be surfing the internet, reading e-mail, sending text messages, working on other classes, checking grades, or such.

Late policy. The penalty for late assignments is a deduction of 10% of the total possible score per 24-hour period past the deadline, including weekends and holidays.

Exam policies. You must contact the instructors ***prior*** to any exam if you have an excused absence and will be unable to attend class on the scheduled exam date; we can arrange to have you take the exam at an **earlier** time. We cannot reschedule an exam because you have an exam or a major assignment due in another course on the same day. We cannot give exams after the regularly scheduled time. In the event of illness we will need documentation as explained above. If you miss an exam, and due to circumstances beyond your control you cannot notify us in advance, then you **must** provide documentation in order to make up the credit. At our discretion we will replace the missed exam with an additional assignment (possibly a different exam) or simply not include the missed exam in determining your final course grade.

Exam content. There are several types of exams in this course: 1) In-Class Mini Exams (25 points each) completed in-class during the first 50 minutes of a regular class period - there are individual and group components to each mini exam; 2) Research Article (RA) Exams (20-25 points each): timed exams submitted

online in Canvas; 3) Final Exam (100 points): individual portion completed in-class during the Registrar scheduled final exam period and group portion submitted online in Canvas. Mini Exams 1-2 and RA 1 Exam will test over all of the concepts and principles covered in the section “Food, Energy, and Temperature.” Mini Exams 3-4 and RA 2 Exam will test over “Oxygen, Carbon Dioxide, and Internal Transport.” Mini Exam 5-6 and RA 3 Exam will test over “Water, Salts, and Excretion.” The Final Exam will be integrated and evaluate comprehensive knowledge (100%). You are responsible for content covered in class as well as in the textbook and assigned research articles, addressed in group work sessions, and contained in assignments outside of class.

Exam feedback. We do not use “exam graders.” Both instructors will team up to grade each entire exam. We do not split up the grading – rather, we both read each response and agree on a score. Therefore there will be no “regrades” of exams. Although we cannot return exams or post keys, your exam will be available for you to look over when we return it during class or by appointment.

Extra credit. You will have several opportunities throughout this course to earn extra credit. Extra credit may be awarded for exemplary class participation and/or exceptional answers on assignments or exams. BONUS questions may be given on exams. Towards the end of the semester, there will be *optional* extra credit assignments in Canvas.

Additional Information on Activities and Assessments

Group Work. Group work is integral to this course and is a crucial feature of both professional and personal life. Self-reflection, shared discovery, and collective learning are key elements for transforming and elevating the learning experiences of each member of your team. BIOC 335/536 provides numerous opportunities to explore ways to engage in a group and to discover strategies for effective teamwork. Which strategy will be most effective for an individual to promote optimal group function will vary with the membership and possibly the activity — and key challenges are gathering multiple ways of interacting, figuring out how to "read" the group, and adapting your style to promote group success. *Groups will be assigned on the first day of class and will work together throughout the semester.*

- **Fictional Animal Project (20% of final grade):** Each team will be assigned a random, fictional animal and your job as a team is to consider if this animal can survive. In particular, you are interested to determine if its body systems are compatible with each other. To help in your analyses, you will have homework question sets and dedicated class time where you can get assistance thinking about your animal. By then, you will have learned about the systems in class. Throughout the semester, you will submit question sets where you 1) explain interactions and function between the different systems; 2) consider trade-offs in function and efficiency; and 3) consider constraints on physiological processes. In the final assignment, you will 1) name your animal and describe/draw/model what it looks like (*your description may be accompanied by a hand or computerized drawing, but it must be an original image; your animal should not closely resemble an extant animal*) and 2) document whether this animal can exist

in the environment you choose as-is or if not, what could be changed so that it can. During the last week of class, you will share the design of your animal.

Engagement & Participation. Many of the assignments and activities you will do throughout this course are formative assessments which are designed to help you learn what you know as well as what you don't know. You will earn some participation points for completion of these assessments, which contribute to 10% of your overall course grade. More importantly, you will receive detailed feedback from us to help you improve your learning.

- **Group Contract:** Working effectively in a group requires commitment to the group and respect for each member of the team. Recognizing both positive and negative group behaviors in ourselves and in each other promotes strong group dynamics. To promote positive group interactions, you will work with your team to prepare a draft, and as a class we will create a consensus Group Contract that each student will sign and adhere to for the course of the semester.
- **In-class Participation**: The effectiveness of the group dynamics during class will be assessed using the following Self-Graded Participation Rubric.This assessment is worth 2 points each class period; at the end of class, your "EXIT TICKET" will be your self-evaluation of your participation. *NOTE: you must attend class to earn these points.*

1. My communication with group members was open and supportive; our group worked together effectively	Not At All (0 pt)	Somewhat (0.5 pt)	Yes (1.0 pt)
2. I was engaged and actively participated in group work in a constructive manner; I contributed to discussions based on assigned reading	Did Not Contribute (0 pt)	One to Two Contributions (0.5 pt)	Multiple Contributions (1.0 pt)

- **Reflections.** Your first reflection will be due the first week of classes. Throughout the semester, a reflection will be due in Canvas on the indicated dates/times that states clearly what you found to be most interesting or challenging in the material since the last Reflection and *why*. These reflections can address what you didn't know previously and find interesting, what impact something you learned has on your own perceptions, what long-term implications a specific discovery/piece of information has on you/on society….whatever was important to you about the material covered. Some reflections associated with specific assignments (e.g., the Fictional Animal Project) may ask you specific questions about the assignment and what/how you learned. *Reflections will be submitted in Quizzes in Canvas.*
- **Minute Questions (MQ).** These short quizzes will be given at the beginning of the class period *over the assigned material for that class*. You are expected to complete the assigned readings in Hill *et al.*, to read assigned research articles, and to view any relevant videos and/or online resources BEFORE CLASS.

We will provide blank note cards for your short answers, which we will collect in class. You will earn up to 3 points for each MQ that you answer and will receive feedback from us about your response. *NOTE: you must be present to earn any points.*

- **Homework:** These questions, worksheets, or problems are designed so you can apply what you learn in readings and discussions to explore concepts in more depth, especially those that are more challenging to understand. While you submit homework individually, we often allow you to discuss the assignment as a team. You will have opportunities to work on these assignments during class.
- **Concept Maps:** Each team will create a concept map for each major unit we cover from the textbook. You will build your construct map during one or more class periods. This activity will help you review what you know and identify what you don't know and provides a visual representation of the integrative nature of physiology.
- **Reading Quizzes:** Throughout the course, there will be quizzes based on the assigned readings in the textbook and research articles. Each short quiz is designed to
  - emphasize key concepts
  - uncover possible misconceptions
  - gauge what you do / don't know
  - prepare you for class discussions and activities

  We encourage you to think about applications of the key concepts and ask yourself additional questions to test yourself.

  The quiz will open a few days before class and close the morning of class. <u>You will have 30 minutes to answer several short answer questions</u>. *It is essential that you read and study the chapter before taking this quiz as you may not be able to "look-up" the correct answer in the reading.* ***You will earn points for each question you answer****; although you will still earn partial credit for an incorrect answer, we encourage you to make a genuine attempt to answer the question correctly (if you just pick an answer to complete the quiz on time, then you will defeat the purpose for the quiz, which is to help you learn the concepts and prepare for class). Your answers will be graded at a later time.*

Research Articles. Throughout the semester you will be assigned research articles from the primary literature. These research articles will investigate physiological concepts or mechanisms related to the unit we are covering in class. In preparation for the in-depth class discussion about the research, you are expected to read the article before coming to class. To help you read the article and prepare for the discussion, we will give you Reading Guides. You will submit a reading quiz in Canvas before class, and there will be a MQ at the beginning of class. We will try different discussion strategies depending on the topic of the paper.

ADDITIONAL ASSIGNMENTS FOR GRADUATE STUDENTS. As you probably know, an institution's post-baccalaureate degree programs, including master's and doctoral degree programs, should be more advanced in academic content than the corresponding undergraduate degree programs. In BIOC 536 we meet this criterion by incorporating the following assignments into the course grade in addition to the worksheets, reflections, group work, and exams that are required of undergraduates in BIOC 335.

Reading Guides (Assigned to RA Exams). You will prepare a reading guide for a recent journal article that is relevant to one of the major topics covered during the semester. The article will be primary literature that reports findings from original research, authored by the original investigators, and peer-reviewed. You are asked to read the article thoroughly and prepare a reading guide similar to the guides provided to the class for the articles. Please prepare your guides using the template. In addition to the full citation, each guide should include a list of terms to review and a minimum of six questions including at least two background questions, at least three paper-specific questions, and at least one Talmudic question, all to fit on one page. Please add a page break and on the second page provide explanations of terms and suggested answers to the questions (sort of an answer key). We may use your guides in future semesters.

Discussion Leader (Assigned to Engagement & Participation). At least once during the semester, you will be the "expert" on the assigned research article for that day and will help lead the class discussion, thus giving you opportunities to gain further teaching experience. In the first week of classes, you will “draw numbers” to find out the order; dates will be announced later.

Course Summary:

Date	Details	
Tue Nov 27, 2018	Hill Ch. 9 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96415)	due by 9am
Thu Nov 29, 2018	Hill Ch. 10-Pt 1 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96418)	due by 9am
Tue Dec 4, 2018	Hill Ch. 10-Pt 2 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96413)	due by 9am
Thu Dec 6, 2018	Hill Ch. 11 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96437)	due by 9am
Tue Dec 18, 2018	Hill Ch. 22 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96435)	due by 9am
Tue Dec 25, 2018	Hill Ch. 23 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96442)	due by 9am
Thu Jan 3, 2019	Hill Ch. 24 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96440)	due by 9am
Tue Jan 8, 2019	Constructive and Destructive Group Behaviors (https://canvas.rice.edu/courses/18727/assignments/99299)	due by 11:59pm

Wed Jan 9, 2019	Reflection 1 (https://canvas.rice.edu/courses/18727/assignments/96412)	due by 11:59pm
Thu Jan 10, 2019	Hill Ch. 6-7 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96551)	due by 9am
	MQ 1 (https://canvas.rice.edu/courses/18727/assignments/96479)	due by 9:30am
Fri Jan 11, 2019	BIOC 335/536 Cellular and Molecular Animal Physiology: Pre-Course Survey (https://canvas.rice.edu/courses/18727/assignments/96448)	due by 11:59pm
Tue Jan 15, 2019	Hill Ch. 8 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96424)	due by 9am
	MQ 2 (https://canvas.rice.edu/courses/18727/assignments/96481)	due by 9:30am
	Biology Review: PART I Fundamentals of Physiology (https://canvas.rice.edu/courses/18727/assignments/96444)	due by 11:59pm
Thu Jan 17, 2019	Research Article 1 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96552)	due by 9am
	MQ 3 (https://canvas.rice.edu/courses/18727/assignments/96482)	due by 9:30am
Tue Jan 22, 2019	Mini Exam 1: Ch. 6-8 (https://canvas.rice.edu/courses/18727/assignments/96473)	due by 10:15am
Thu Jan 24, 2019	Hill Ch. 26-Pt 2 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96425)	due by 9am
	MQ 4 (https://canvas.rice.edu/courses/18727/assignments/98765)	due by 9:30am
	Hill Ch. 26-Pt 1 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96438)	due by 11am
Fri Jan 25, 2019	Group Contract (https://canvas.rice.edu/courses/18727/assignments/96462)	due by 11:59pm
Tue Jan 29, 2019	MQ 5 (https://canvas.rice.edu/courses/18727/assignments/98766)	due by 9:30am
Thu Jan 31, 2019	MQ 6 (https://canvas.rice.edu/courses/18727/assignments/98767)	due by 9:30am
	Reflection 2 (https://canvas.rice.edu/courses/18727/assignments/96445)	due by 11:59pm
	HW 1: Countercurrent Heat Exchange Mechanisms (https://canvas.rice.edu/courses/18727/assignments/96466)	due by 11:59pm

Fri Feb 1, 2019	Concept Map 1: Part II Food, Energy, and Temperature (https://canvas.rice.edu/courses/18727/assignments/96452)	due by 11:59pm
Tue Feb 5, 2019	Mini Exam 2: Ch. 9-11 (https://canvas.rice.edu/courses/18727/assignments/96474)	due by 10:15am
Wed Feb 6, 2019	Fictional Animal Question Set 1: Thermoregulation and Preliminary Animal (https://canvas.rice.edu/courses/18727/assignments/96455)	due by 11:59pm
Tue Feb 12, 2019	MQ 7 (https://canvas.rice.edu/courses/18727/assignments/98768)	due by 9:30am
Thu Feb 14, 2019	MQ 8 (https://canvas.rice.edu/courses/18727/assignments/98769)	due by 9:30am
Tue Feb 19, 2019	Mini Exam 3: Ch. 22-24 (https://canvas.rice.edu/courses/18727/assignments/96475)	due by 10:05am
Thu Feb 21, 2019	Hill Ch. 27 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96427)	due by 9am
	MQ 9 (https://canvas.rice.edu/courses/18727/assignments/98770)	due by 9:30am
Mon Feb 25, 2019	BIOC 335/536 Cellular and Molecular Animal Physiology: Mid-Course Survey (https://canvas.rice.edu/courses/18727/assignments/96446)	due by 11:59pm
Tue Feb 26, 2019	MQ 10 (https://canvas.rice.edu/courses/18727/assignments/96546)	due by 9:30am
Thu Feb 28, 2019	MQ 11 (https://canvas.rice.edu/courses/18727/assignments/96545)	due by 9:30am
	Reflection 3 (https://canvas.rice.edu/courses/18727/assignments/96430)	due by 11:59pm
	Concept Map 2: Part V Oxygen, Carbon Dioxide, and Internal Transport (https://canvas.rice.edu/courses/18727/assignments/96453)	due by 11:59pm
	HW 2: Oxygen Affinity, O2 Equilibrium Curves, and Oxygen Carrying Capacity (https://canvas.rice.edu/courses/18727/assignments/96467)	due by 11:59pm
Mon Mar 4, 2019	HW 3: The Vertebrate Circulatorium (https://canvas.rice.edu/courses/18727/assignments/96441)	due by 11:59pm
Tue Mar 5, 2019	Hill Ch. 28-Pt 1 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96422)	due by 9am
	MQ 12 (https://canvas.rice.edu/courses/18727/assignments/98771)	due by 9:30am

	HW 4: Circulation (https://canvas.rice.edu/courses/18727/assignments/96468)	due by 11:59pm
Thu Mar 7, 2019	Mini Exam 4: Ch. 24-26 (https://canvas.rice.edu/courses/18727/assignments/96476)	due by 10:15am
Fri Mar 8, 2019	Hill Ch. 28-Pt 2 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96434)	due by 9am
	Fictional Animal Question Set 2: Respiratory and Circulatory Systems (https://canvas.rice.edu/courses/18727/assignments/98719)	due by 11:59pm
Tue Mar 19, 2019	MQ 13 (https://canvas.rice.edu/courses/18727/assignments/98772)	due by 9:30am
Thu Mar 21, 2019	Hill Ch. 29-Pt 1 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96416)	due by 9am
	MQ 14 (https://canvas.rice.edu/courses/18727/assignments/98773)	due by 9:30am
Tue Mar 26, 2019	CCM Activity Pre-Class Question (https://canvas.rice.edu/courses/18727/assignments/96423)	due by 9am
	MQ 15 (https://canvas.rice.edu/courses/18727/assignments/98774)	due by 9:30am
Thu Mar 28, 2019	Hill Ch 30 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96443)	due by 9am
	Mini Exam 5: Ch. 27-28 (https://canvas.rice.edu/courses/18727/assignments/96477)	due by 10:15am
Tue Apr 2, 2019	MQ 16 (https://canvas.rice.edu/courses/18727/assignments/96550)	due by 9:30am
Wed Apr 3, 2019	Fictional Animal Question Set 3: Respiratory, Circulatory, and Excretory Systems (https://canvas.rice.edu/courses/18727/assignments/96456)	due by 11:59pm
Thu Apr 4, 2019	MQ 17 (https://canvas.rice.edu/courses/18727/assignments/96549)	due by 9:30am
Tue Apr 9, 2019	MQ 18 (https://canvas.rice.edu/courses/18727/assignments/98776)	due by 9:30am
	HW 5: Countercurrent Multiplier (https://canvas.rice.edu/courses/18727/assignments/96469)	due by 11:59pm
Wed Apr 10, 2019	Concept Map 3: Part VI Water, Salts, and Excretion (https://canvas.rice.edu/courses/18727/assignments/96454)	due by 11:59pm

Thu Apr 11, 2019	Mini Exam 6: Ch. 29-30 (https://canvas.rice.edu/courses/18727/assignments/96478)	due by 10:15am
Tue Apr 16, 2019	In-class participation (https://canvas.rice.edu/courses/18727/assignments/96470)	due by 11am
Thu Apr 18, 2019	Fictional Animal Question Set 4: Animal Description and Environment (https://canvas.rice.edu/courses/18727/assignments/96458)	due by 11:59pm
	Fictional Animal Showcase (https://canvas.rice.edu/courses/18727/assignments/96459)	due by 11:59pm
Fri Apr 19, 2019	BIOC 536: Discussion Leader (https://canvas.rice.edu/courses/18727/assignments/100617)	due by 11:59pm
	Reflection 4: Fictional Animal Project (https://canvas.rice.edu/courses/18727/assignments/96429)	due by 11:59pm
Wed Apr 24, 2019	BIOC 536: Research Article Reading Guide (https://canvas.rice.edu/courses/18727/assignments/100615)	due by 11:59pm
Sat Apr 27, 2019	Final Exam: Individual (https://canvas.rice.edu/courses/18727/assignments/96460)	due by 12pm
Mon Apr 29, 2019	Final Exam: Group (https://canvas.rice.edu/courses/18727/assignments/98620)	due by 11:59pm
Wed May 1, 2019	Cellular and Molecular Animal Physiology Research Article (https://canvas.rice.edu/courses/18727/assignments/96449)	due by 11:59pm
	Integrated Concept Map (https://canvas.rice.edu/courses/18727/assignments/96471)	due by 11:59pm
	Letter to the next class (https://canvas.rice.edu/courses/18727/assignments/96472)	due by 11:59pm
	Reflection 5: Group Work (https://canvas.rice.edu/courses/18727/assignments/96433)	due by 11:59pm
	Reflection 6: Overall Course (https://canvas.rice.edu/courses/18727/assignments/96421)	due by 11:59pm
	BIOC 335/536 Cellular and Molecular Animal Physiology: Post-Course Survey (https://canvas.rice.edu/courses/18727/assignments/96447)	due by 11:59pm
	Final Exam (https://canvas.rice.edu/courses/18727/assignments/96426)	
	RA Exam 1 - Bats (https://canvas.rice.edu/courses/18727/assignments/96432)	

- RA Exam 1 - Polar Bear (https://canvas.rice.edu/courses/18727/assignments/96420)
- RA Exam 2: High Altitude Birds (https://canvas.rice.edu/courses/18727/assignments/96439)
- RA Exam 2: Seals (https://canvas.rice.edu/courses/18727/assignments/96428)
- RA Exam 3: Dogfish Shark (https://canvas.rice.edu/courses/18727/assignments/96436)
- RA Exam 3: Kangaroo Rat (https://canvas.rice.edu/courses/18727/assignments/96411)
- Research Article 2 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96553)
- Research Article 3 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96554)
- Research Article 4 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96555)
- Research Article 5 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96556)
- Research Article 6 Reading Quiz (https://canvas.rice.edu/courses/18727/assignments/96557)